



DATA ANALYSIS UPDATES - Review of contributions for the coming paper

Summary of the work

- Calibration: E scale with neutrons → applying the time correction
 - AmC source – ACU and CLS
 - Spallation neutrons following cosmic muons
 - Neutrons from IBDs
- Background and calibration:
 - Po214 : as background for fit + calibration E scale
- Backgrounds:
 - Atmospheric NC
 - Fast neutrons
 - Double neutrons

Detector response - calibration

Samples for Escale of neutrons

AmC calibration source

- Apply IBD selection to get the prompt and delayed signal
- Fit the n-H capture peak
- Both for ACU (x,y,z=0) and CLS

Spallation neutrons

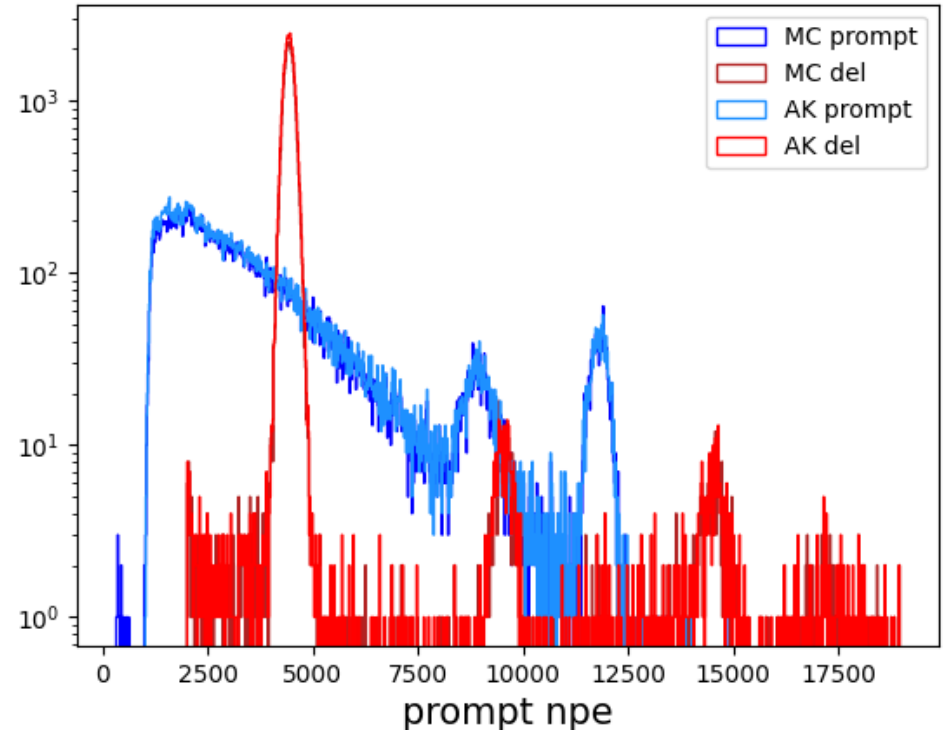
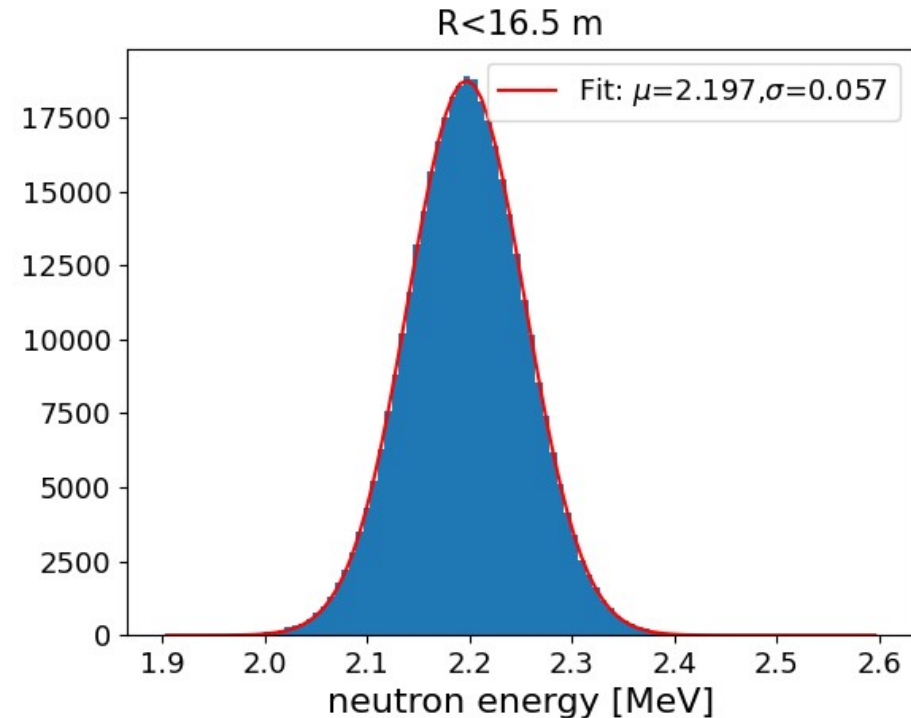
- Apply CD-WP muon search and keep muon followers
- Selected clean SPN sample among followers:
 - $\text{muon_npe} < 0.7\text{e}8 \text{ npe}$
 - $550 \mu\text{s} < \text{Dt-to-muon} < 700 \mu\text{s}$
 - $\text{hit_times_std} < 275 \text{ ns}$ and $\text{hit_times_mean} < 300$
- Fit the n-H capture peak

Delayed IBDs

- File from Vanessa&Cristobal WP2
- Fit the n-H capture peak

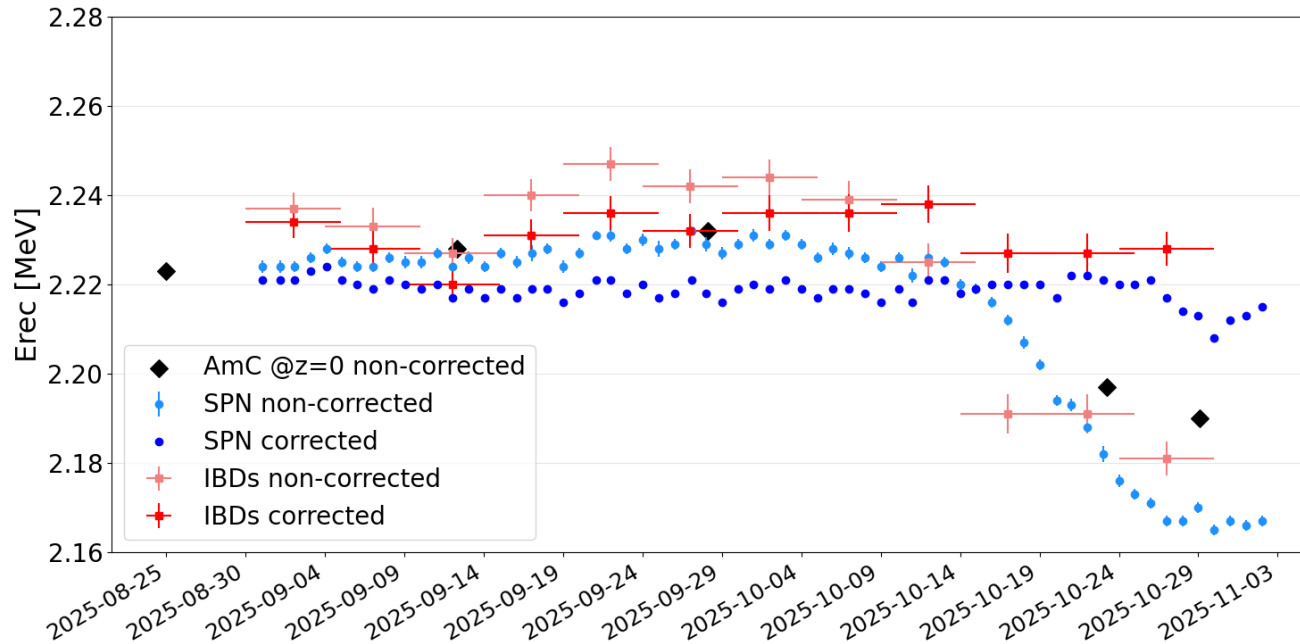
Calibration with AmC source

- Apply IBD selection to get the prompt and delayed signal → checked with Amina
- Fit the n-H capture peak



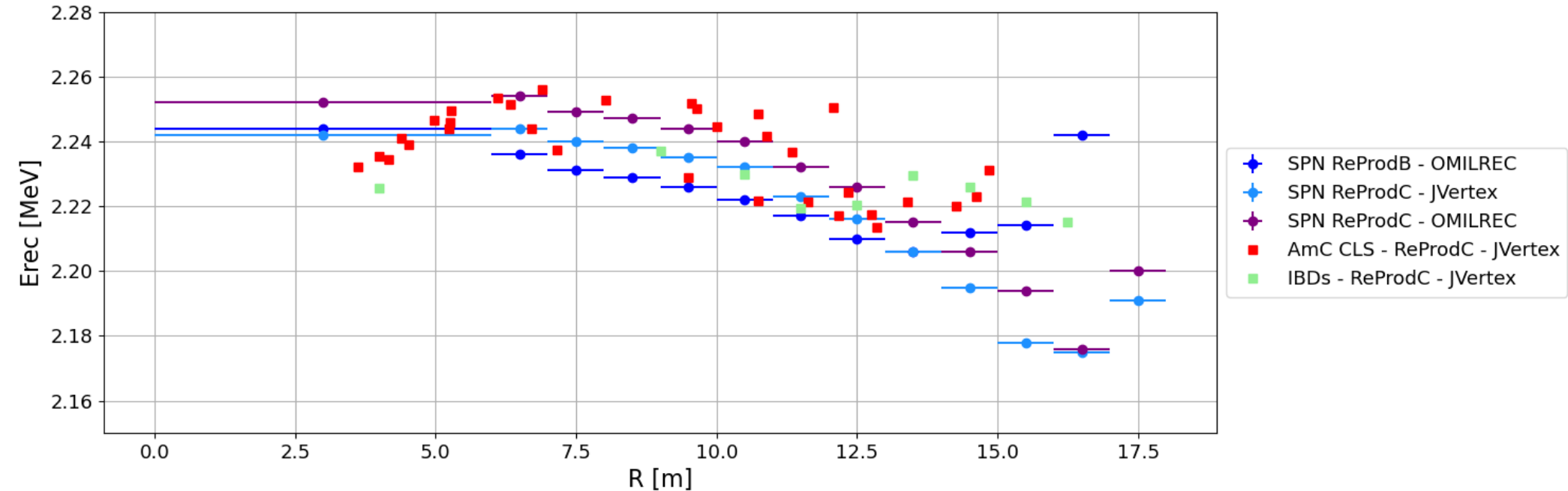
All n-H sources together: time evolution

- Good agreement between AmC and spn before correction
- IBDs are in general above spn before and after correction
- Correction for spn a bit worst in the last days of reprodC



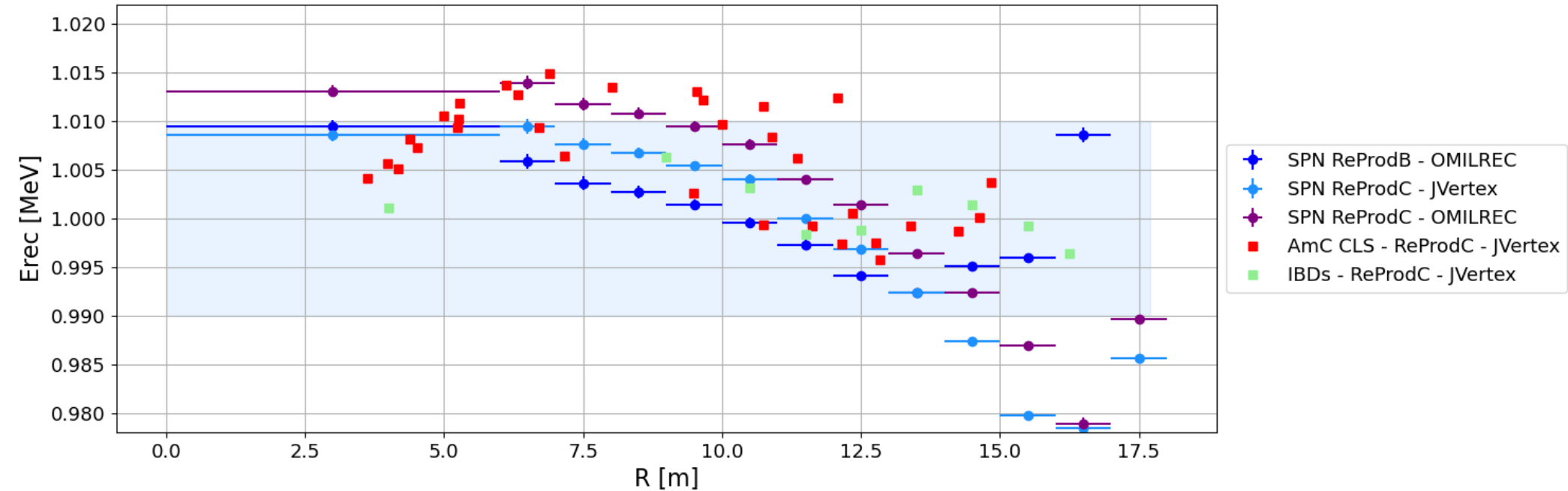
All n-H sources together: non-uniformity

- NOTE: no time correction applied yet



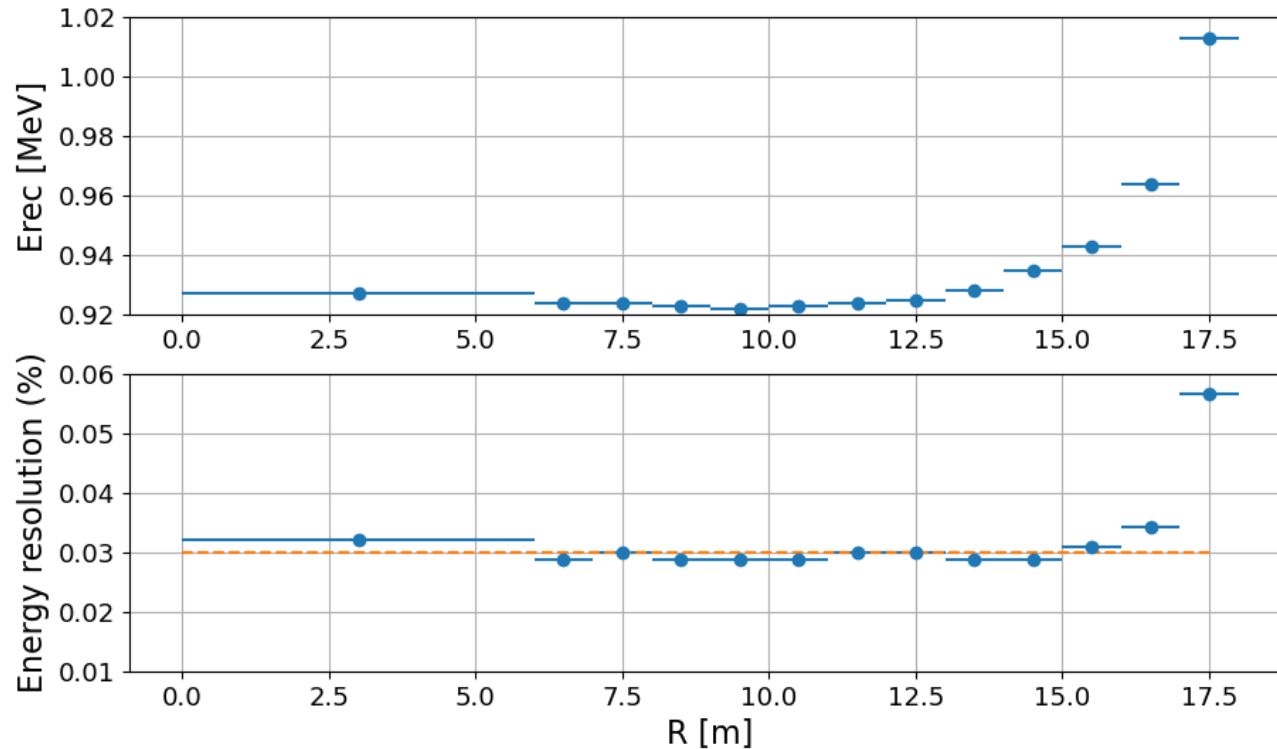
All n-H sources together: non-uniformity

- NOTE: no time correction applied yet



Po214: non-uniformity

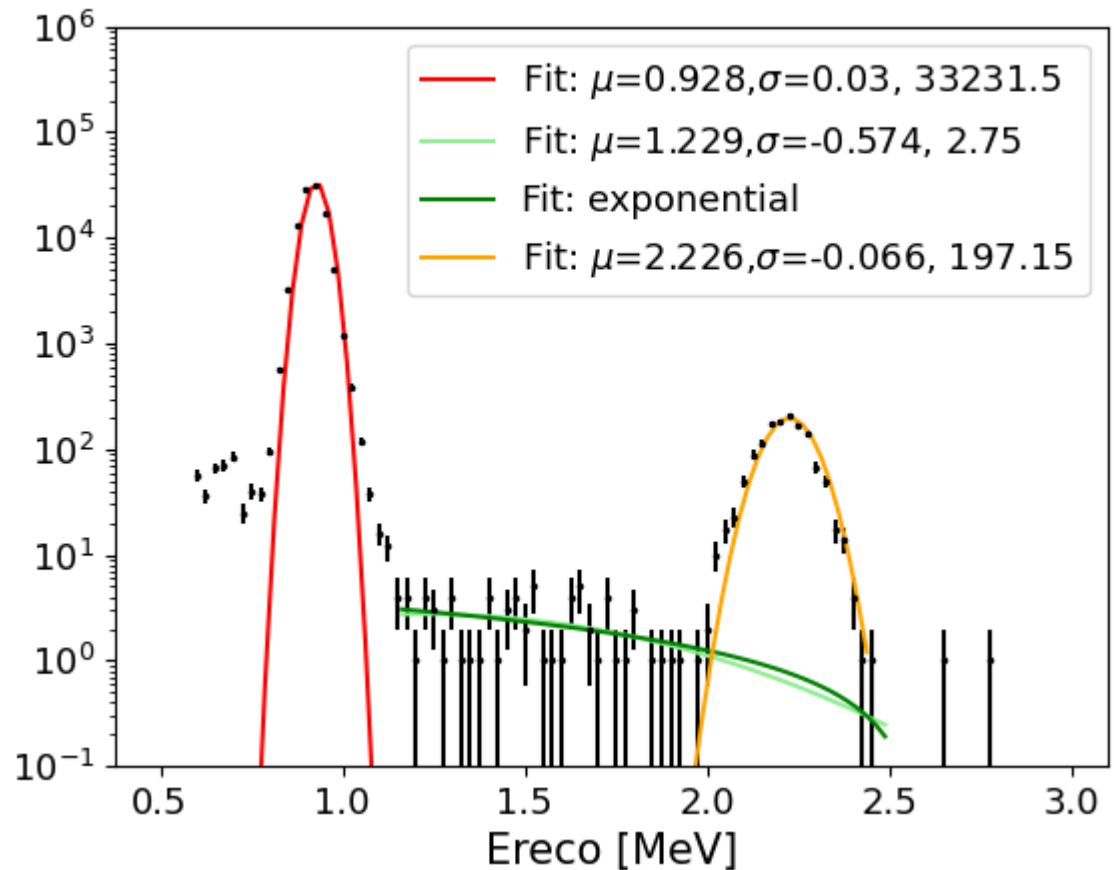
- OEC selection + FV with chimney



Backgrounds

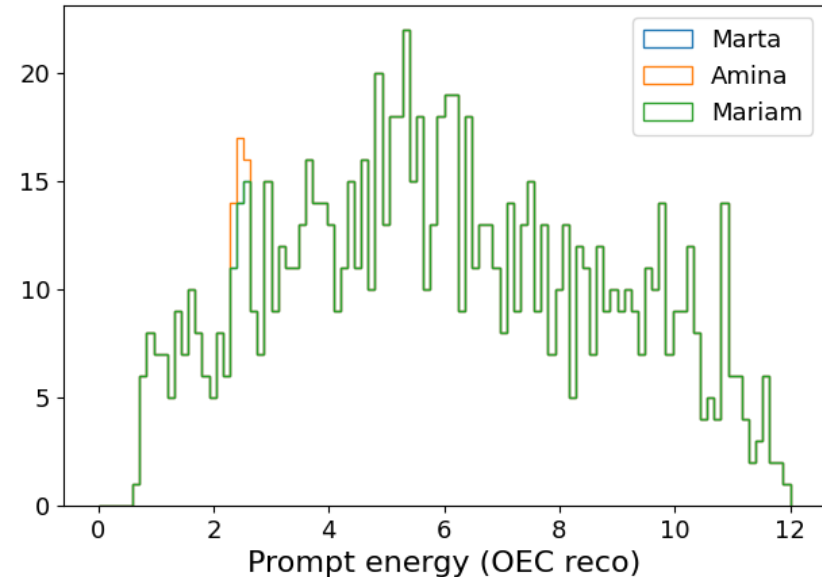
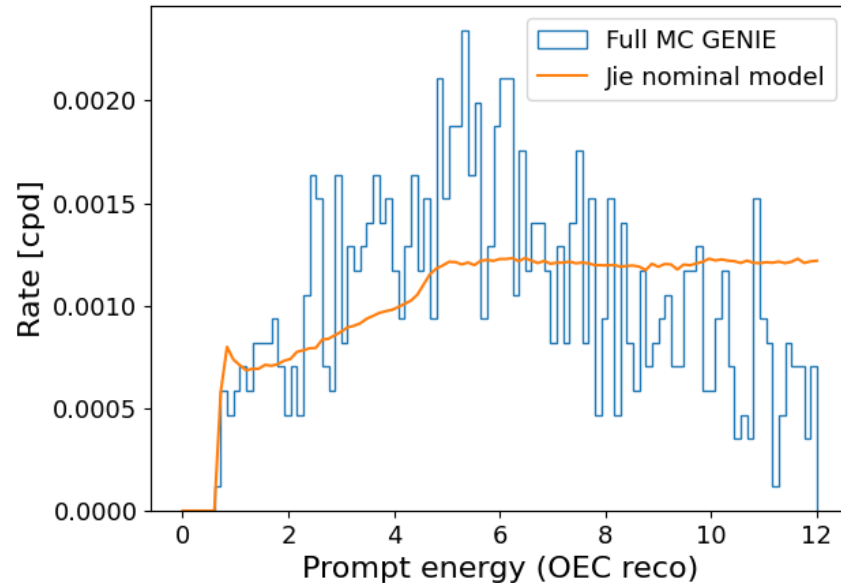
Po214: as background

- Secondary branch of the Bi decay gives a tail that contributes to the delayed IBD range (2-2.5 MeV)
 - Evaluate the fraction of Po214 fallir in the Ed range:
 - Fit tail (in between peaks)
 - Fit Po214 peak at low E
 - Ratio gives $f=0.014\%$
- Compatible with Cristobal check and Runze studies with MC truth



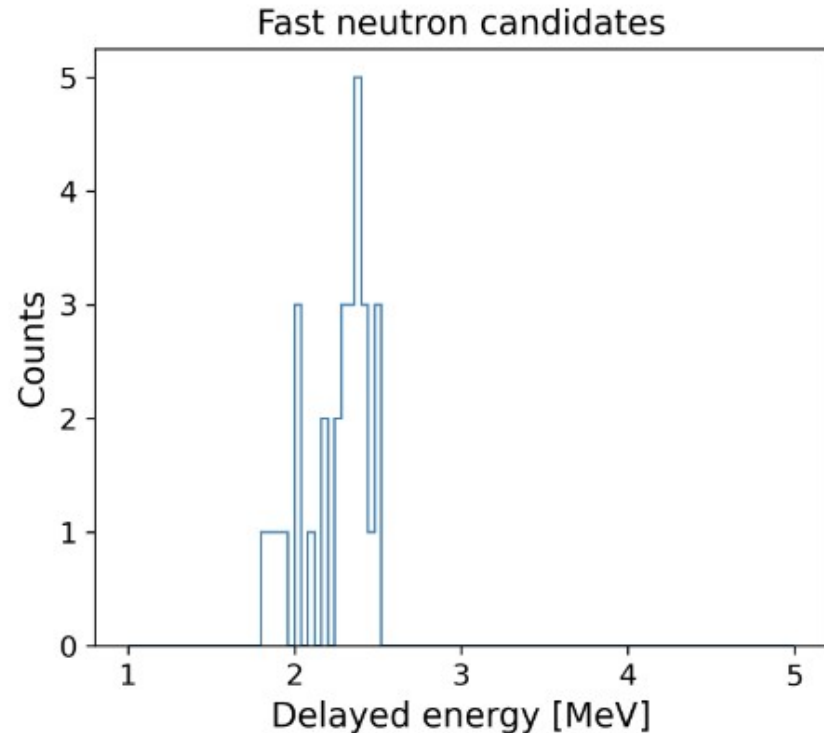
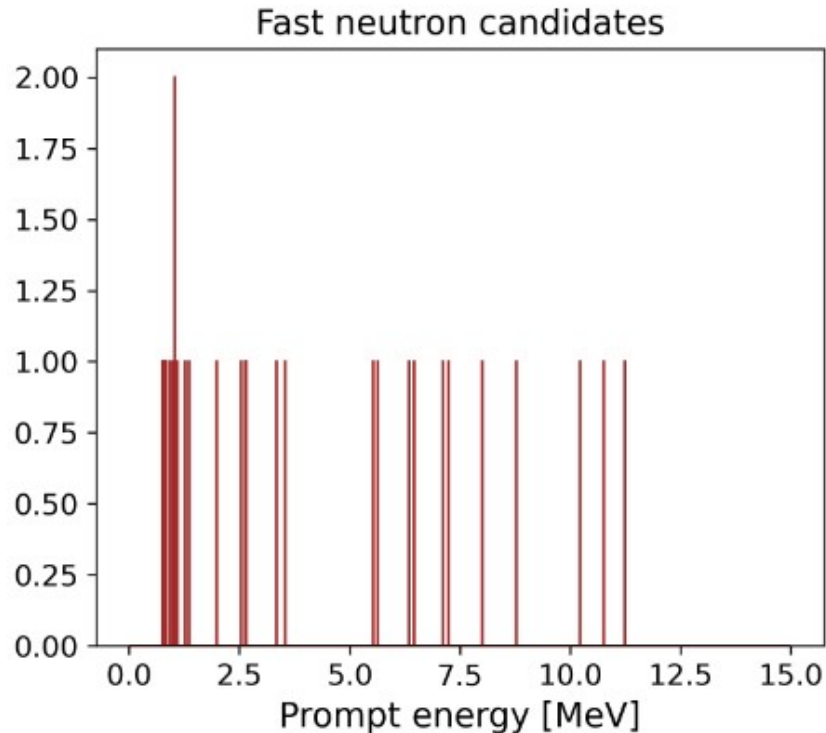
Atmospheric NC

- Cross-checked among codes
- Good shape and rate agreement with nominal model at detsim level

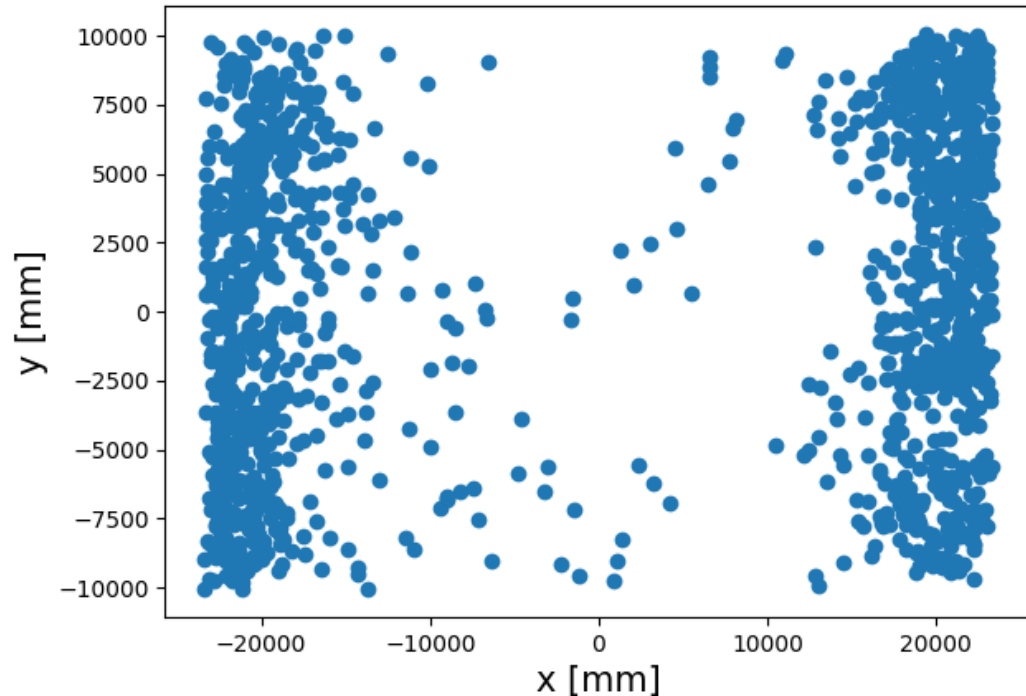


Fast neutrons DATA: after a WP-only μ

- Search for an IBD after WP-only μ : prompt is proton recoil, delayed fast-n
- Only ~20 events found, not able to do any shape studies, but constrain rate: ~ 0.07 cpd



Fast neutrons DATA: after a TT-only μ

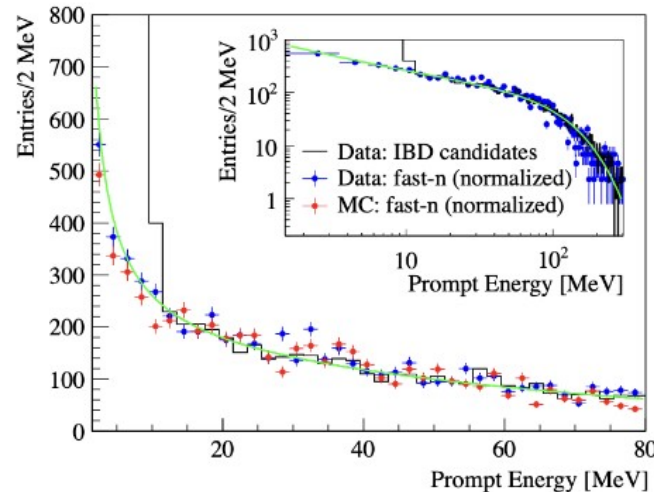
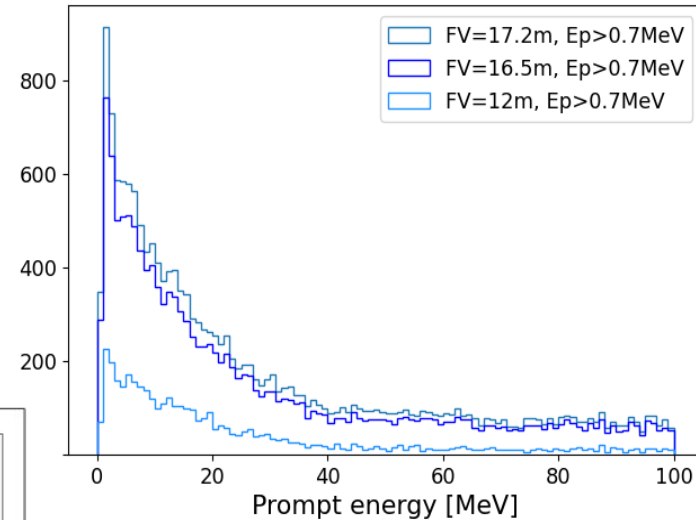
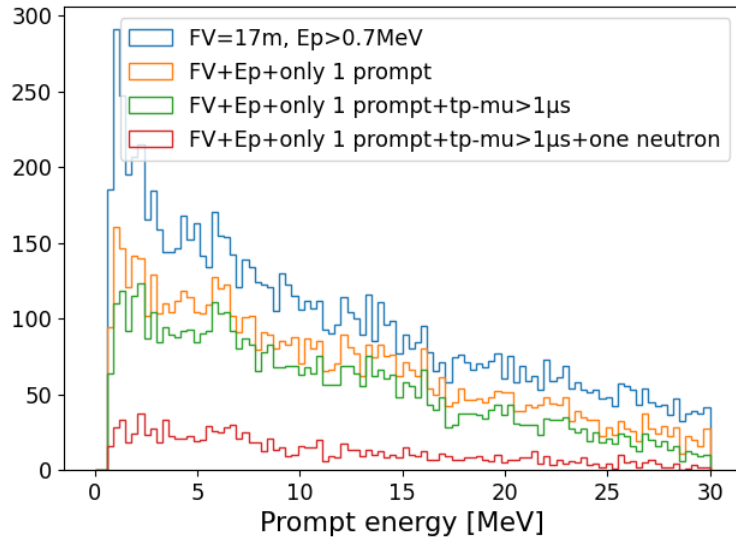


- Can we see fast neutrons from the rock associated to these events?
 - Search for an IBD 2ms from these TT-only muons
 - None found in 89 runs...
- The fast-neutrons following these events seem to be lost in the WP or going outside to the hall/rock, they do not entered the CD
- Very very low stats

Fast neutrons MC: constrain shape

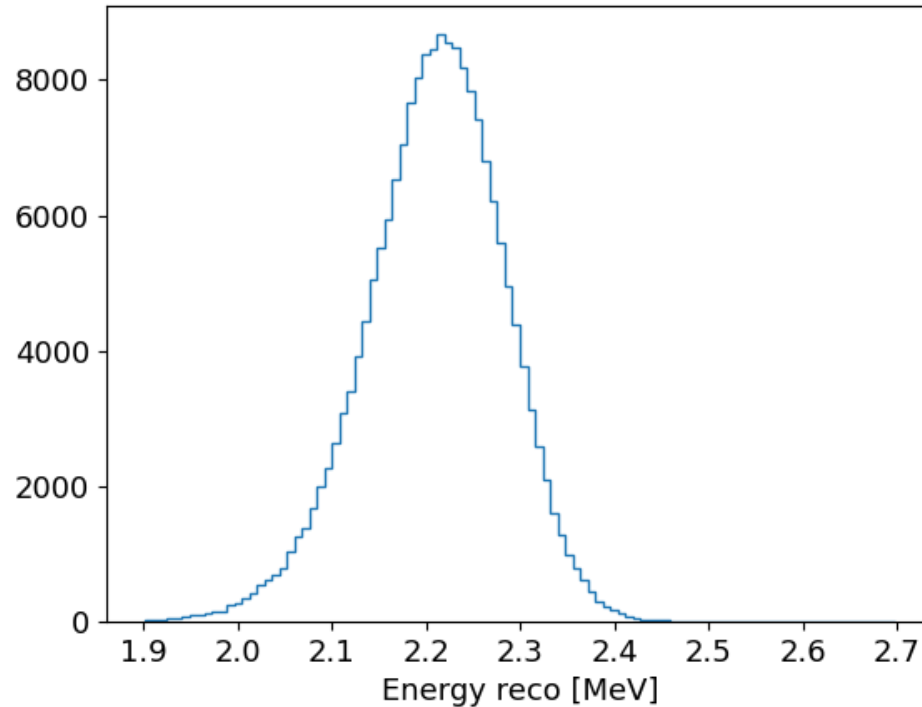
- effect of cuts
- effect of FV

→ shape agreement with DayaBay results



Double-neutrons

- Complicated to get a high stat sample in data
- So rate was let free in fit and shape comes from my spn sample



Unblinding results, just out of oven!

Oscillation Parameters

(Vertical lines are PDG2025)

